

## NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

### HEAVY USE AREA PROTECTION

(Acre)

CODE 561

#### DEFINITION

The stabilization of areas frequently and intensively used by people, animals or vehicles by establishing vegetative cover, by surfacing with suitable materials, and/or by installing needed structures.

#### PURPOSE

- Reduce soil erosion
- Improve water quantity and quality
- Improve air quality
- Improve aesthetics
- Improve livestock health

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies to urban, agricultural, recreational or other frequently and intensively used areas requiring treatment to address one or more resource concerns.

#### CRITERIA

##### General Criteria Applicable to All Purposes

**Laws and Regulations.** All planned work shall comply with Federal, state, and local laws and regulations. [These include Vermont Accepted Agricultural Practice and Large and Medium Farm Operation Regulations.](#)

Measures shall be taken to limit the generation of particulate matter.

Safety of the users shall be incorporated into the design of the heavy use area protection.

**Design Load.** The design load will be based on the type of traffic, (vehicular, animal, or human) anticipated on the heavy use area. The minimum design load for areas that support vehicular traffic will be a wheel load of 4000 lbs.

**Foundation.** All site foundations shall be evaluated for soil moisture, permeability, texture and bearing strength in combination with the design load and anticipated frequency of use.

A base course of gravel, crushed stone, other suitable material and/or geotextile shall be provided on all sites with a need for increased load bearing strength, drainage, separation of material and soil reinforcement. Natural Resources Conservation Service (NRCS), National Engineering Handbook (NEH), Parts 642 and 643 (formerly, NEH, Section 20) and AASHTO M-288 (latest edition) provide guidance in quality specification and geotextile selection.

An impervious barrier shall be [installed](#) on sites with a [permeable](#) foundation (high permeability rate) [or directly on bedrock](#), where there is a need to protect ground water from contamination.

Foundation preparation shall consist of removal and disposal of soil and other material that are not adequate to support the design loads.

**Surface Treatment.** The surface treatment shall meet the following criteria:

**Bituminous Pavement.** The thickness of the pavement course, the kind and size of aggregate, the type of proportioning of bituminous materials, and the mixing and placing of these materials shall be in

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accordance with Department of Transportation criteria for the expected loading.

**Concrete.** The quality and thickness of concrete and the spacing and size of reinforcing steel shall be appropriate for the expected loading. Concrete shall be installed in accordance to Vermont Construction Specification 31 – Concrete. For barnyards and feedlots, the minimum concrete thickness shall be four inches. Slabs with a maximum slope of 10.0% shall be reinforced by either of the follow methods:

1. No Reinforcing (plain) – control joints spaced at 10' o.c. or less
2. W1.4 x W1.4 (10 GA.), 6 inch x 6 inch welded wire fabric (WWF) reinforcement shall be installed at or slightly above the middle of the slab. Control joints spaced at 30' o.c. or less.

Slabs with slopes greater than 10% shall be reinforced with #3 or #4 @ 18" o.c. or equivalent WWF. When heavy equipment loads are to be resisted and/or where a non-uniform foundation cannot be avoided, an appropriate design procedure incorporating subgrade resistance parameters such as ACI 360 shall be used. Concrete slab surface shall be roughened for better traction.

**Other Cementitious Materials.** Soil cement, roller compacted concrete, and coal combustion by-products (flue gas desulphurization sludge and fly ash) may be used as surface material if designed and installed to withstand the anticipated loads and surface abrasion.

**Aggregate.** A fine or coarse aggregate surface shall be minimum 2-inches thick. Aggregate may be clean bank run material. It shall be well graded, free draining, non-friable, durable stone and coarse sand containing no more than 10% fines (200 sieve). The maximum particle size shall not exceed two-thirds the thickness of the layer being placed. A properly designed geotextile shall be installed under the gravel surface material before installation.

**Other.** Surfacing materials, such as cinders, tanbark, bark mulch, brick chips, shredded rubber and/or sawdust, shall have a minimum layer thickness of 2 inches. A properly

designed geotextile shall be installed under these materials.

**Bedded Pack Facilities.** In general, roofed heavy use area facilities that will be maintained as a bedded pack shall not be surfaced with concrete or asphalt, unless justification is provided to protect ground water resources, such as shallow bedrock conditions or in areas where the soil is excessively drained.

**Structures.** All structures shall be designed according to appropriate NRCS standards and specifications or Engineering Handbook recommendations.

**Sprays and Artificial Mulches.** When utilizing sprays of asphalt, oil, plastic, manufactured mulches, and similar materials, the manufacturer's recommendations for application shall be incorporated into the design.

**Drainage and Erosion Control.** Provision shall be made for surface and subsurface drainage, as needed, and for disposal of runoff without causing erosion or water quality impairment. Practices such as diversion, waterways and roof runoff management shall be used to exclude unpolluted run-on water from the treatment area. All treatment areas shall be shaped to prevent ponding of water.

**Vegetative Measures.** Liming, fertilizing, soil preparation, seeding, mulching, sodding and vegetation management shall be according to Vermont Construction Specification 52 – Seeding. If vegetation is not appropriate, other measures shall be used to accomplish the intended purpose.

#### **Additional Criteria for Areas Utilized by Livestock (Barnyards)**

**CNMP.** A Comprehensive Nutrient Management Plan (CNMP) shall be developed before a heavy use area protection can be designed for livestock use. The plan shall include decisions by producer to manage animal movement in such a way as to not create another untreated barnyard area.

**Location.** To minimize the potential for contamination of streams, barnyards and/or other livestock concentration areas shall be located outside of the 25-year floodplains. Separation distances shall be such that prevailing winds and landscape elements such

as building arrangement, landforms, and vegetation minimize odors and protect aesthetic values. When possible, springs and wells shall be located as far from barnyards and other livestock concentration areas as practical. Where separation distance is a concern, practices shall be installed to protect near by springs and wells from contaminated runoff.

Barnyards and/or other livestock concentration areas shall be installed no closer than 200 feet to a neighboring well or potable water source.

**Size.** Heavy Use Area size will vary depending on the size and weight of the animals that will be using the facility. A paved area for dairy cattle shall not exceed 50 square feet per animal unit. An unpaved roofed heavy use area that will be maintained as a bedded pack shall not exceed 100 square feet per animal unit. This additional area will allow room for bale feeders and watering facilities as well as additional room for accumulated dry pack manure. The treated area shall extend an appropriate distance from facilities such as portable hay rings, water troughs, feeding troughs, mineral boxes and other facilities where livestock concentrations cause resource concerns.

NRCS conservation practice standards Critical Area Planting (342); Fencing (382); Prescribed Grazing (528a); Filter Strip (393); Use Exclusion (472); *Animal Trails and Walkways* (575); *Diversion* (362); or *Roof Runoff Management, Code* (558) shall be used as companion practices, when needed to meet the intended purpose of the heavy use area protection.

Provisions shall be made to collect, store, utilize and/or treat manure accumulations and contaminated runoff in accordance with other NRCS conservation practice standards.

**Soil and foundation.** The barnyard or livestock concentration area shall be located in soils with an acceptable permeability that meets all applicable regulation. If the barnyard is located in an area where the soils are predominantly sandy or gravelly, a SEEPAGE analysis shall be performed or other documentation to show minimal threat to the ground water.

The barnyard shall have a floor elevation that is a minimum of 3 feet above the seasonal high water table. The water table may be lowered by use of perimeter drains, if feasible, to meet this requirement. Barnyards surfaced with gravel or other porous material shall have a floor elevation that is a minimum of 3 feet above bedrock. If bedrock is less than 3 feet below the proposed floor elevation, a concrete floor slab with water tight joints shall be installed or other acceptable water tight liner. A minimum of two feet of soil material shall be placed between bedrock and bottom of the floor slab. All proposed blasting must be approved by the State Conservation Engineer.

**Curbing.** Curbing shall be installed only in areas necessary to:

- Aid in scraping and removal of manure from the barnyard
- Divert clean water away from barnyard
- Divert manure laden runoff to storage or treatment facility.

Minimum curb height shall be six inches except at locations where equipment has to cross. In areas where the curbing is used to aid scraping equipment to remove manure, the minimum curb (or wall) height shall be two feet. Curbing may be constructed of concrete, asphalt, pressure treated wood, earth or other durable material. For organic operations, timber curbing must meet what is acceptable to National Organic Program standards. Curbing shall be designed against scour and over turning forces of manure scraping and handling equipment.

**Walkways.** Walkways shall be surfaced or installed in accordance to practice standard 575 - *Animals Trails and Walkways*.

**Fencing.** Any fencing necessary around feedlots and barnyards to contain livestock or exclude wildlife and people shall be designed and installed in accordance to Practice Standard 382 - *Fence*.

**Roof Water Management.** To the fullest extent possible, all roof water shall be diverted away from agricultural heavy use areas. Roof water management practices shall be installed in accordance to Practice Standard 558 - *Roof Runoff Structure*.

**Roofing.** A roof may be installed over a heavy use area for the purpose of diverting precipitation away from the area when no other practices are practical and cost effective. The roof and supporting structure shall be designed to withstand all anticipated loads including internal and external loads, hydrostatic uplift pressure, concentrated surface and impact loads, water pressure due to seasonal high water table, and frost or ice pressure and load combinations in compliance with this standard and applicable local building codes. Lateral loading imposed on the side support structure of the facility by the anticipated accumulated manure and other forces shall also be considered.

The roof snow and wind loads shall be as specified in ASCE 7-02, Minimum Design Loads for Buildings and Other Structures. If the facility is to serve as part of a foundation or support for a building, the total load shall be considered in the structural design. The structural design shall consider all items that will influence the performance of the structure, including loading assumptions, material properties and construction quality. Design assumptions and construction requirements shall be indicated on standard plans. Fabricated structures shall be designed according to the criteria in the following references as appropriate:

- Steel: "Manual of Steel Construction", American Institute of Steel Construction.
- Timber: "National Design Specifications for Wood Construction", American Forest and Paper Association.
- Concrete: "Building Code Requirements for Reinforced Concrete, ACI 318", American Concrete Institute.
- Masonry: "Building Code Requirements for Masonry Structures, ACI 530", American Concrete Institute.

Hoop type structures shall be designed with truss type supports. Tubular support members will not be allowed.

The building foundation shall be proportioned to safely support all superimposed loads without excessive movement or settlement.

Where a non-uniform foundation cannot be avoided or applied loads may create highly variable foundation loads, settlement should be calculated from site-specific soil test data. Index tests of site soil may allow correlation with similar soils for which test data is available. If no test data is available, presumptive bearing strength values for assessing actual bearing pressures may be obtained from Table 1 or another nationally recognized building code. In using presumptive bearing values, adequate detailing and articulation shall be provided to avoid distressing movements in the structure.

**Table 1 - Presumptive Allowable Bearing Stress Values<sup>1</sup>**

Foundation Description	Allowable Stress
Crystalline Bedrock	12000 psf
Sedimentary Rock	6000 psf
Sandy Gravel or Gravel	5000 psf
Sand, Silty Sand, Clayey Sand, Silty Gravel, Clayey Gravel	3000 psf
Clay, Sandy Clay, Silty Clay, Clayey Silt	2000 psf
<sup>1</sup> Basic Building Code, 12th Edition, 1993, Building Officials and Code Administrators, Inc. (BOCA)	

### **Additional Criteria for Areas Utilized for Recreation**

The treated area shall be conducive to the overall recreation area and aesthetically blend with the general landscape and surroundings.

Plants, landscaping timbers, traffic control measures, wooden walkways, etc. shall be evaluated for effectiveness, aesthetics and accessibility as covered by the Americans with Disabilities Act.

## CONSIDERATIONS

When stabilizing heavily used areas consider adjoining land uses and the proximity to residences, utilities, cultural resource areas, wetlands or other environmentally sensitive areas, and areas of special scenic value.

For heavy use areas conducive to protection by vegetation, consideration must be given to the effect(s) of treading and/or miring. The vegetative species selected should tolerate and persist under heavy use conditions. If practicable, consider increasing the size of the area and/or establishing a rest/non-use period to allow plant recovery and increase vigor.

Heavy use area protection effects on the water budget, especially on volumes and rates of runoff, infiltration, and transpiration due to the installation of less pervious surfaces should be considered in the selection of surfacing materials.

The transport of sediments, nutrients, bacteria, organic matter from animal manures; oils, chemicals and particulate matter associated with vehicular traffic; and soluble and sediment-attached substances carried by runoff should be considered in selection of companion conservation practices.

Consider using additional air quality conservation practices such as Windbreak/Shelterbelt Establishment (code 380) or Herbaceous Wind Barriers (code 603) to impede transport of particulate matter between the source (i.e., heavy use area) and nearby sensitive areas.

If the purpose of the heavy use area protection is improvement of water quality, the heavy use area should be relocated as far away from the waterbody or watercourse as possible. Any work in and/or discharges near streams, wetlands or waterbodies may require a permit from the US Army Corps of Engineers, state water quality (permitting) authority, or local authority.

The size of heavy use areas utilized by livestock is dependent on the landowner's operation including type and number of animal, confinement periods, and/or the intended use. The size of treatment areas can range from 30 square feet per animal in partial-confinement to 400 square feet per animal in total

confinement to 4000 or more square feet for animal exercise areas. Heavy use protection areas should be kept as small as practicable.

When surface treatments such as bark mulch, wood-fiber or other non-durable materials are used for short-term livestock containment areas, consideration should be given to vegetation of the affected area with a cover crop.

For areas with aggregate surfaces that will be frequently scraped, consideration should be given to the use of concrete or cementitious materials to lessen the recurring cost of aggregate replacement.

Due consideration should be given to environmental concerns, economics, the overall waste management system plan, and safety and health factors.

Neighboring relationships should be considered when locating and installing a heavy use area, roofed or otherwise.

This practice may adversely affect cultural resources. Planning, installation and maintenance must comply with GM 420, Part 401.

## PLANS AND SPECIFICATIONS

Plans and specifications for heavy use area protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications shall include construction plans, drawings, job sheets or other similar documents. These documents shall specify the requirements for installing the practice, including the kind, amount and quality of materials to be used.

Plans prepared by the roof manufacturer or consulting engineer shall be stamped by licensed professional engineer in the state of Vermont. Other state PE stamps will not be allowed. The stamped drawings need to state the design wind and snow loads. The drawings shall also include the size, lumber grade and embedment details of the truss support posts and other details.

## OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be prepared for and reviewed with the landowner or operator. The owner/operator shall sign the O&M plan to indicate an understanding of the requirements and commitment to operate and maintain the practices as specified. The plan shall specify that the treated areas and associated practices are inspected annually and after significant storm events to identify repair and maintenance needs.

The O&M plan shall detail the level of repairs needed to maintain the effectiveness and useful life of the practice.

For livestock operations, the O&M plan for heavy use areas may be included as a part of the overall waste management plan. Periodic removal and management of manure accumulations will be addressed in the O&M plan.

Conservation practices should be implemented that limit particulate matter emission into long-term maintenance plans.

The plan shall contain the operational requirements for scraping the barnyard or removing manure. The plan shall state that all waste shall be utilized at locations, times, rates, and volume in accordance with the overall nutrient management plan.

Watering facility shall be monitored, checked and repaired to prevent overflowing.

## REFERENCES

- USDA – NRCS Agricultural Waste Management Field Handbook.
- Using All-Weather Geotextile Lanes and Pads, Janni, Funk, & Holmes. Midwest Plan Service, AED 45, July 1999.